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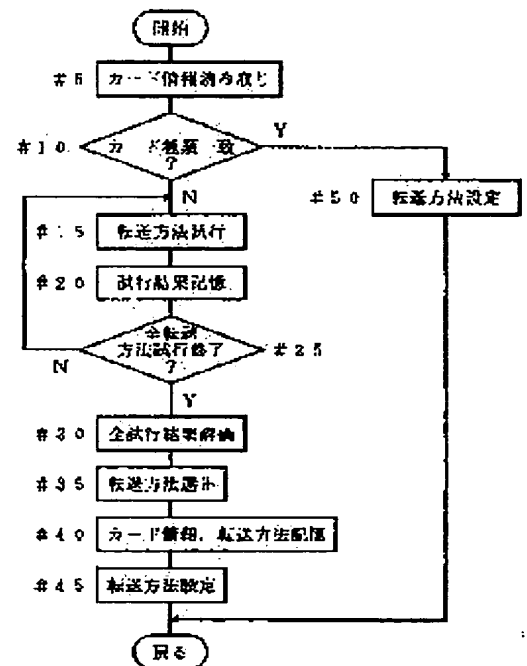
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(54) DIGITAL CAMERA

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a digital camera, which employs a transfer method for sufficiently utilizing the advantage of an attachable/detachable recording medium.

SOLUTION: In the digital camera, a plurality of transfer methods exist and a memory for storing recording medium kinds, and their optimum transfer methods is arranged so that the stored transfer method is employed in the case of mounting the recording medium whose kind is stored. When the recording medium whose kind is not stored is mounted, a transfer test is performed by using the plurality of transfer methods, the optimum one is selected from the applicable transfer methods based on the test result, the selected transfer method is employed and also the kind of the recording medium and the selected transfer method are stored.



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CLAIMS

[Claim(s)]

[Claim 1] In a digital camera which has two or more transfer methods for data transfer between removable recording media, Make a transfer method of 1 beforehand elected about one or more kinds of recording media based on a transfer test from one or more transfer methods applicable to a kind and a recording medium of a

recording medium correspond, and it memorizes, A digital camera using for data transfer between recording media which distinguished a kind of recording medium with which it equipped whenever it equipped with a recording medium, and equipped with a transfer method corresponding to a kind of recording medium with which it equipped.

[Claim 2]When not contained in a kind of recording medium which a kind of recording medium with which it equipped has memorized, The digital camera according to claim 1 which elects a transfer method of 1 and is characterized by using for data transfer between recording media equipped with an elected transfer method out of one or more transfer methods which can perform a transfer test using two or more transfer methods, and can apply it to a recording medium with which it equipped between recording media with which it equipped.

[Claim 3]In a digital camera which has two or more transfer methods for data transfer between removable recording media, When distinguishing a kind of recording medium with which it equipped whenever it equipped with a recording medium and not having memorized a kind of recording medium with which it equipped, A transfer test using two or more transfer methods is performed between recording media with which it equipped, While electing a transfer method of 1, making a kind of recording medium with which it equipped, and an elected transfer method correspond and memorizing out of one or more transfer methods applicable to a recording medium with which it equipped, A digital camera using for data transfer between recording media equipped with a transfer method corresponding to a kind of recording medium with which it equipped when using for data transfer between recording media equipped with an elected transfer method and having memorized a kind of recording medium with which it equipped.

[Claim 4]The digital camera according to claim 2 or 3 electing a transfer method which had least power consumption in a transfer test.

[Claim 5]The digital camera according to claim 2 or 3 electing a transfer method which was the highest in a transfer test.

[Claim 6]The digital camera according to claim 2 or 3 electing a transfer method which had little power consumption and was high in a transfer test.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the digital camera which can be equipped with the recording medium with which kinds differ in more detail about the digital camera which records the photoed picture on a removable recording medium.

[0002]

[Description of the Prior Art]A digital camera repeats and photos a picture with an approximately regulated cycle, and records the photoed picture on a removable recording medium according to the recording instruction given by the user between them. The picture recorded on the recording medium is behind used by other apparatus, such as a personal computer.

[0003]The removable recording medium needs not to lose the contents of record, even when not receiving a nonvolatile thing, i.e., an electric power supply, and it is desirable to have a small light weight. From such a request, from the early stage of the spread of digital cameras, the semiconductor memory card which contained

the flash memory is used as a recording medium, and is used abundantly still now.

[0004]Data transfer speed of a recording medium is high, its storage capacity is large again, and it is desirable for there to be little power consumption moreover. As a result of doing active research aiming at the recording medium which satisfies these requirements, various recording media are developed now. For example, the hard disk which there are what was constituted from an OR circuit, a thing constituted from a NAND circuit, a thing constituted from an AND circuit, etc., and planned small size highly, and made the outside card shape also by what is named a flash memory generically is also developed.

[0005]A data transfer method is different by composition of a recording medium, and if a flash memory is taken for an example, there are what has only I/O mode as a transfer method, a thing which has only trueIDE mode, and a thing which has the both sides in I/O mode and trueIDE mode. Generally, the trueIDE mode of a transfer rate is higher than I/O mode. The transfer rate of a flash memory is higher than a hard disk. The hard disk which power consumption is also different by composition of a recording medium, and is driven mechanically has more power consumption than a flash memory. However, it has the feature that storage capacity of a hard disk is large compared with a flash memory.

[0006]One kind of not only recording medium but the digital camera which enabled it to equip with two or more kinds of recording media is developed with diversification of a recording medium. Such a digital camera is constituted so that it can equip with the recording medium which is provided with one or two or more and with which kinds differ the applied part which can usually change a transfer method in each applied part.

[0007]If an applied part is equipped with a recording medium, a digital camera will read the maker which is describing at the recording medium, a part number, storage capacity, etc., will distinguish the kind of recording medium from a maker and a part number, and will set up the transfer method for the recording medium according to a kind. The transfer method for the kind of recording medium and a recording medium is beforehand determined as 1 to 1 by the maker of the digital camera.

Even when equipped with the recording medium which has two or more transfer methods, the transfer method for the recording medium is fixed to either.

As this determination serves as the highest possible transfer rate, it is made based on the general feature of a transfer method.

For example, when equipped with the flash memory which has the both sides in I/O mode and trueIDE mode, it is set as trueIDE mode.

[0008]

[Problem(s) to be Solved by the Invention]However, the transfer method determined to the recording medium which has two or more transfer methods may not restrict with what always realizes the highest transfer rate, but another transfer method may realize the highest transfer rate depending on the composition of a digital camera. Power consumption may become large when they adopt the transfer method used as the highest transfer rate, since a transfer rate and power consumption are not related directly. In such a case, if another transfer method is adopted, power consumption may be reduced substantially, without reducing a transfer rate not much.

[0009]Therefore, determining the transfer method for the recording medium which has two or more transfer methods, without taking into consideration the affinity of the recording medium and digital camera cannot say a suitable method. In order to employ the feature of a recording medium efficiently, it is preferred to define a transfer method by a more flexible method.

[0010]Even if a transfer method is a recording medium of 1, when not having memorized the maker or part number beforehand, the conventional digital camera cannot judge as which transfer method it should be set, and all the existing recording media with which it can equip cannot be used for it. Only in the digital camera manufactured after that, it becomes possible to use the feature of the outstanding recording medium which it naturally cannot perform setting up the transfer method for the recording medium of part number strangeness developed in the future, either, but is newly developed.

[0011]This invention was made in view of such a problem, and has two or more transfer methods, It aims at providing the digital camera which can also use the recording medium developed in the future further for the purpose of providing the digital camera which can use the transfer method which fully employs the feature of the recording medium efficiently when it equips with a recording medium.

[0012]

[Means for Solving the Problem]To achieve the above objects, in a digital camera which has two or more

transfer methods in this invention for data transfer between removable recording media, Make a transfer method of 1 beforehand elected about one or more kinds of recording media based on a transfer test from one or more transfer methods applicable to a kind and a recording medium of a recording medium correspond, and it memorizes, It shall use for data transfer between recording media which distinguished a kind of recording medium with which it equipped whenever it equipped with a recording medium, and equipped with a transfer method corresponding to a kind of recording medium with which it equipped.

[0013]This digital camera makes a transfer method of 1 applicable to a recording medium of a kind and a kind of recording medium correspond, is memorized, and adopts a transfer method corresponding to a kind of that recording medium as data transfer between recording media with which it was equipped. A transfer method made to correspond to a kind of recording medium is chosen based on a actual transfer test. When there are two or more transfer methods applicable to a recording medium, power consumption, a transfer rate, etc. can evaluate a result of a transfer test paying attention to a certain characteristic about transmission, and can choose the optimal transfer method for a digital camera. Therefore, it becomes possible to fully employ the feature of a recording medium efficiently.

[0014]A maker of a digital camera performs election of a transfer test or a transfer method, for example. If a transfer method which elected by doing a transfer test about a complete range of the existing recording medium which a digital camera can use is made to memorize, it will be possible to actually use a recording medium of these complete ranges, and it will become a digital camera which can moreover employ the feature of each recording medium efficiently.

[0015]When not contained in a kind of recording medium which a kind of recording medium with which it equipped has memorized, this digital camera, Out of one or more transfer methods which can perform a transfer test using two or more transfer methods, and can apply it to a recording medium with which it equipped between recording media with which it equipped, a transfer method of 1 shall be elected and it shall use for data transfer between recording media equipped with an elected transfer method.

[0016]Even when are done in this way and it is equipped with a recording medium with a kind strange for a digital camera, it becomes possible to use the recording medium, and a recording medium developed after manufacture of a digital camera can also be used. And since election of a transfer method is performed based on a actual transfer test, the feature of a recording medium of kind strangeness is efficiently employed completely like a recording medium which has memorized a kind and a transfer method.

[0017]To achieve the above objects, in a digital camera which has two or more transfer methods in this invention again for data transfer between removable recording media, When distinguishing a kind of recording medium with which it equipped whenever it equipped with a recording medium and not having memorized a kind of recording medium with which it equipped, A transfer test using two or more transfer methods is performed between recording media with which it equipped, While electing a transfer method of 1, making a kind of recording medium with which it equipped, and an elected transfer method correspond and memorizing out of one or more transfer methods applicable to a recording medium with which it equipped, When using for data transfer between recording media equipped with an elected transfer method and having memorized a kind of recording medium with which it equipped, it shall use for data transfer between recording media equipped with a transfer method corresponding to a kind of recording medium with which it equipped.

[0018]Although this digital camera makes a transfer method of 1 applicable to a recording medium of a kind and a kind of recording medium correspond, and is memorized like the above-mentioned digital camera and a transfer method corresponding to a kind of that recording medium is adopted as data transfer between recording media with which it was equipped, Whenever it is equipped with a recording medium of kind strangeness, a transfer test is actually done, a transfer method of 1 is elected, and a kind of the recording medium and an elected transfer method are memorized. That is, a kind of recording medium which has memorized a transfer method is increased with the digital camera itself.

[0019]For this reason, it becomes possible to reduce power consumption which it not only can employ efficiently the feature of a recording medium of an usable complete range developed existing and in the future, but holds down the number of times of a transfer test done for that preparation to accumulate to necessary minimum, and a transfer test takes. If a maker of a digital camera performs processing in which a digital camera is equipped with a complete range of the existing recording medium which can be used, Only when equipping with a recording medium developed after that, a transfer test will be done, and in actual use by a user, power consumption of a transfer test becomes very small.

[0020]In composition for which the digital camera itself does a transfer test, a transfer method which had least

power consumption, a transfer method which was the highest, or a transfer method which had little power consumption and was high can be elected in a transfer test. If it does in this way, it will become little power consumption, high transfer efficiency, or the digital camera excellent in a field of both them.

[0021]

[Embodiment of the Invention] Hereafter, it explains, referring to drawings for one embodiment of the digital camera of this invention. The appearance of the digital camera 1 of this embodiment is shown in drawing 1 - drawing 4, and the circuitry is shown in drawing 5. As for the front view of the digital camera 1, and drawing 2, a side view and drawing 4 of a rear elevation and drawing 3 are [drawing 1] bottom views.

[0022] The digital camera 1 comprises the body part 2 and the image pick-up part 3 (a thick line shows drawing 1 - 4) of approximately rectangular parallelepiped shape. The image pick-up part 3 is attached to the side of the body part 2, and has the taking lens 301 in the front face. The taking lens 301 is a zoom lens with a macro function, and is provided with the diaphragm of caliber immobilization. In taking-lens 301 back inside the image pick-up part 3, the charge coupled device (CCD) 303 which is an image sensor is arranged (refer to drawing 5). CCD303 arranges by turns three sorts of pixels which respond selectively to red (R) light, green (G) light, and blue (B) light to two dimensions, and is constituted as a color area sensor.

[0023] Inside the image pick-up part 3, The signal which directs the timing of operations, such as a start of the photoelectric conversion of digital-disposal-circuit 313 and CCD303 which processes the analog signal which CCD303 outputs, and an output of the accumulated electric charge, is generated. It has the timing generator 314 given to CCD303, the zoom motor 306 into which the focal distance of the taking lens 301 is changed, and the focal motor 307 into which the focus of the taking lens 301 is changed. The image pick-up part 3 is equipped also with the light control circuit 304 for carrying out automatic dimming control in flash photographs and the modulated light sensor 305, AF sensor 308 that detects the distance to the candidate for photography, and the optical finder 31.

[0024] The digital camera 1 is constituted so that most taking lenses 301 can be accommodated in the image pick-up part 3 at the time of un-taking a photograph, and the taking lens 301 takes the accomodated location set to the camera station set up at the time of photography at the time of un-taking a photograph. The zoom motor 306 is used also for movement between the camera station of the taking lens 301, and an accomodated location. The lens sensor 309 for detecting in any the taking lens 301 shall be between a camera station and an accomodated location is formed in the image pick-up part 3.

[0025] The grip part 4 and the flash part 5 are formed in the front face of the body part 2, and the shutter release 9 is formed in the upper surface of the body part 2. If the shutter release 9 is half-pressed, and the signal S1 will be emitted and it will be pressed fully, it will emit the signal S2 further. The automatic-focusing regulation (AF) function in which the digital camera 1 doubles the focus of the taking lens 301 automatically to the candidate for photography, It has the automatic exposure regulation (AE) function to adjust exposure of CCD303 automatically according to the luminosity for photography, and the signal S1 directs the start of AF control and AE control. The signal S2 directs record of the image data showing photography of the picture for record, and the photoed picture for record.

[0026] As shown in drawing 2, the transmission type liquid crystal display (LCD) 10, the push button-type six switches 11, the electric power switch 12 and the 4 contact switches 13, the switch 14 of a sliding type, and the two light emitting diodes 15a and 15b are formed in the back of the body part 2. LCD10 displays the message to the picture and user who took a photograph. The switch 11 is used for various setting out about operation of the digital camera 1, and the electric power switch 12 is used for the start of the electric power supply from a power supply to each part, and directions of a stop.

[0027] The 4 contact switches 13 comprise a single operating member and four points of contact, and constitute the four switches 13a-13d. The switches 13a and 13b are used for setting out of the focal distance of the taking lens 301, i.e., directions of zooming, and the switches 13c and 13d are used for directions of exposure amendment of CCD303 in AE control.

[0028] The digital camera 1 has photographing mode, reproduction mode, and a menu mode, and the switch 14 is used for setting out in these modes. Photographing mode is the mode which generates the image data which photos a picture by CCD303 and expresses the photoed picture. If photography and generation of image data are repeatedly performed with an approximately regulated cycle (for example, 1 / 30 seconds) and the signal S2 is emitted by operation of the shutter release 9, the picture for record will be photoed according to it, and the image data showing the picture will be recorded on a recording medium. In photographing mode, the picture photoed can be promptly displayed on LCD10, and a live view can also be provided. [one] [after another] At

this time, LCD10 functions as an electronic view finder.

[0029] Reproduction mode is the mode which reads the image data currently recorded on the recording medium, and displays the picture on LCD10. A menu mode is the mode in which display a guide message on LCD10 and setting out about operation is performed according to operation of the switch 11.

[0030] While the electric power supply from a power supply to each part is performed, the light is switched on, and the light emitting diode 15a turns on the light emitting diode 15b, while input and output of the recording medium are performed. The light emitting diode 15a is used also in order to tell a user about the fall of power supply voltage.

[0031] The two push button type switches 16a and 16b are formed in the back of the image pick-up part 3. The switch 16a is used for directions of whether to display a live view on LCD10 in photographing mode, and whenever the switch 16a is operated, ON and OFF of a live view display changes. When taking a photograph using the optical finder 31 chiefly, power consumption can be held down by turning OFF the display of LCD10. The display of the reproduced image in reproduction mode and a menu mode or a guide message is performed irrespective of operation of the switch 16a. The switch 16b is used for directions of whether to carry out macro photographing.

[0032] In the digital camera 1, the four AA dry cells E which carried out the series connection are used as a power supply. The removable memory card 8 is used as a recording medium which records image data. Two-sheet wearing is possible for the memory card 8. The memory cards 8 and those motion control are explained in full detail behind. The battery chamber 18 which stores the cell E to the body part 2 as shown in drawing 4, The card room 17 which has the two card slots 17a and 17b, and stores the memory card 8 is formed, and the bottom of the body part 2 is equipped with the lid 19 of the clam shell type which opens and closes the battery chamber 18 and the card room 17.

[0033] It is also possible to replace with a memory card and to equip the card slot 17a with a USB card or an audio card. The opening 19a for exposing the terminal part of a USB card on the lid 19 is formed, and direct continuation of the digital camera 1 can be carried out to an external instrument by carrying out cable connection to the terminal of a USB card.

[0034] As shown in drawing 3, DC input terminal 20 is formed in the side of the body part 2, and the digital camera 1 operates also with the electric power given from the outside via the terminal 20 besides the built-in cell E.

[0035] The circuitry of the digital camera 1 is explained with reference to drawing 5. The digital disposal circuit 313 established in the image pick-up part 3 comprises a correlation double sampling (CDS) circuit and an automatic gain control (AGC) circuit. A CDS circuit reduces the noise of the analog signal which CCD303 outputs, and an AGC circuit adjusts the level of all the signals from a CDS circuit with the gain. The gain of a CDS circuit is changed by the whole control part described below.

[0036] The body part 2 is provided with the whole control part 211 which controls the whole digital camera 1. ROM211a as which the whole control part 211 described the control program and control parameter, It is connected to the final controlling element 250 which is provided with nonvolatile RAM211c for memorizing the information about RAM211b used for temporary memory, and the memory card 8 which is recording media, and is operated by the user. The final controlling element 250 transmits operation by a user to the whole control part 211 including the above-mentioned shutter release 9 and many operating members of switch 14 grade.

[0037] The body part 2 is provided with A/D converter 205, the black level correction circuit 206, the white balance (WB) circuit 207, the gamma correction circuit 208, and the image memory 209, in order to process the output signal of CCD303 given from the digital disposal circuit 313 and to generate image data. A/D converter 205 changes the analog signal from the digital disposal circuit 313 into a 10-bit digital signal, and the black level correction circuit 206 doubles the black level of the digitized signal with the level of a standard.

[0038] The WB circuit 207 changes individually the level of the signal of each color component of R, G, and B using the level conversion table supplied from the whole control part 211 so that a proper white balance may be obtained after the gamma correction performed to the next. The whole control part 211 sets up the conversion factor (inclination of the characteristic) of each color component of a level conversion table for every photoed picture. The gamma correction circuit 208 performs nonlinear-ized processing to the signal from the WB circuit 207 so that it may be suitable for a display.

[0039] The image data which expresses the picture photoed by CCD303 by processing from the digital disposal circuit 313 to the gamma correction circuit 208 is generated. The image memory 209 memorizes the image data generated in this way by one frame. The image memory 209 has a storage capacity equivalent to the pixel

number of CCD303, and memorizes the signal generated from the output of each pixel in the position corresponding to the pixel. Although the next circuit is actually provided with the processing result of each circuit from the black level correction circuit 206 to the gamma correction circuit 208 via RAM211b of the whole control part 211, In drawing 5, in order to clarify the flow of processing, from the black level correction circuit 206 to the image memory 209 is connected and expressed with the arrow of the dashed line.

[0040]The back light source 10a of VRAM210 used for the body part 2 as a buffer memory when displaying a picture on LCD10, and LCD10, And it also has the card interface (I/F) 212 which reads the image data from the writing and the memory card 8 of image data to the memory card 8. VRAM210 has a storage capacity equivalent to the pixel number of LCD10, and a whole control part 211, When displaying a live view and a reproduced image, a signal is extracted at intervals of a predetermined pixel out of the image data read from the image memory 209 or the memory card 8, and those signals are written in VRAM210.

[0041]In addition to this, the body part 2 is equipped also with the motor drive circuits 216 and 217 of 202 or 2 timing control circuits, the real-time clock (RTC) 219, the flush control circuit 220, the feeder circuit 218, and the voltage detector 213. The timing control circuit 202 supplies the clock for control to the timing generator 314 or A/D converter 205 according to the directions from the whole control part 211 while generating the reference clock which is the minimum unit of a cycle of operation.

[0042]The motor drive circuits 216 and 217 drive the zoom motor 306 and the focal motor 307 according to the directions from the whole control part 211, respectively. RTC219 is for managing the time of photography and always operates with the electric power from a power supply (un-illustrating) different from the cell E.

[0043]The flush control circuit 220 controls luminescence and its preparation of the flash part 5 according to the directions from the whole control part 211. In the digital camera 1, in flash photographs, are made to perform automatic dimming control, and the whole control part 211, Light-receiving by the modulated light sensor 305 is made to start at the same time it directs luminescence to the flush control circuit 220, and the stop of luminescence is directed to the flush control circuit 220 at the same time the signal which shows that the modulated light sensor 305 received the light of the specified quantity is given from the light control circuit 304.

[0044]The feeder circuit 218 detects the electric power supplied from the outside via DC input terminal 20, and when there is an electric power supply from the outside and there is no electric power supply from the outside about the electric power, it supplies the electric power of the cell E to each part, such as CCD303 and the card slots 17a and 17b. The electric power supply from the feeder circuit 218 to each part is controlled by the whole control part 211.

[0045]The voltage detector 213 detects the voltage of the electric power which the feeder circuit 218 supplies, and when the voltage is lower than a predetermined value, it tells that to the whole control part 211. According to this, the whole control part 211 blinks the light emitting diode 15a, and a user is told about power supply voltage falling. The voltage detector 213 changes a predetermined value according to the kind of memory card 8 with which it is equipped. When equipped with the memory card with much power consumption like a hard disk card, a predetermined value is specifically made high, and a predetermined value is made low when equipped with the memory card which contained semiconductor memory, such as a flash memory. Thereby, according to the power consumption of a memory card, it is possible to emit warning at a suitable stage.

[0046]When photography of the picture for record is directed by the signal S2 in photographing mode, the whole control part 211 makes photography preparations of AE control etc. promptly, and makes CCD303 photo the picture for record. And the image data of the photoed picture for record is read from the image memory 209, tag information is generated, both are given to card I/F212, and it is made to record on the memory card 8. In that case, the whole control part 211 compresses image data according to a JPEG system. The whole control part 211 extracts a signal from image data at intervals of a predetermined pixel, generates another image data, and also makes this record on the memory card 8. This image data expresses the thumbnail image of 1/several [which was photoed / of the picture of high resolution] sizes. The information about photographing conditions, such as a frame number, and exposure besides a photographing date, is included in tag information.

[0047]The structure of the data recorded on the memory card 8 is typically shown in drawing 6. The picture information of one frame comprises tag information, the compressed 1600x1200 pixels high-resolution image data, and 80x60-pixel thumbnail image data, and has the data volume of about 1 MB. Naturally it depends on the storage capacity of the memory card 8 for the frame number of the picture which can be recorded on the memory card 8. When having equipped with the audio card, it is possible to also record a voice file for every frame, and the information about the link to a voice file describes to a tag.

[0048]As mentioned above, the digital camera 1 is provided with the two card slots 17a and 17b, and can equip

with the two memory cards 8 simultaneously. It is possible to equip each of the card slots 17a and 17b with the semiconductor memory card which contained the flash memory from which the kind of memory card 8 with which the card slots 17a and 17b can be equipped is not restricted to one, for example, circuitry differs, or a hard disk card. The card slots 17a and 17b can also be simultaneously equipped with the memory card in which kinds differ.

[0049]In the digital camera 1 which equipped the taking lens 301 with the fixed diaphragm, regulation of the photoelectric conversion time (electronic shutter speed) of CCD303 performs AE control. Based on a well-known APEX system, the whole control part 211 performs AE control. It asks for the luminosity for [required for AE control] photography from the generated image data. That is, let total of the signal strength of the pixel corresponding to the prescribed range (for example, center section) of CCD303 be a luminosity for photography among image data.

[0050]As mentioned above, although it starts with AF control according to the signal S1, AE control performs only detection of the luminosity for photography until the signal S2 is emitted, and when photography of the picture for record is directed by the signal S2, it adjusts electronic shutter speed for the first time. In the meantime, electronic shutter speed is fixed. It is avoidable that become possible to perform generation processing of image data with a constant period by this, and the control management of the whole control part 211 becomes complicated.

[0051]When the electronic shutter speed computed from the luminosity which the candidate for photography was dark and detected turns into speed which may start blurring, While setting electronic shutter speed as blurring critical speed, the gain of the AGC circuit included in the digital disposal circuit 313 is raised, and it compensates that CCD303 becomes a underexposure. Thereby, even when the candidate for photography is to some extent dark, the picture which expresses the candidate for photography with a good luminosity can be provided. While taking a photograph with blurring critical speed and setting a gain as the maximum when the candidate for photography is dark so that a underexposure is unsuppliable, even if it makes a gain into the maximum, it demands warning of it becoming a underexposure and taking a suitable measure, such as performing flash photographs, from a user.

[0052]While equipping each of the card slots 17a and 17b with two or more transfer methods in the digital camera 1 corresponding to enabling it to equip with the memory card 8 in which kinds differ for the data transfer between the memory cards 8, He is trying to change a transfer method according to the kind of memory card 8 with which it has equipped. And the correspondence relation between the kind of memory card and a transfer method is set up based on the actually done transfer test.

[0053]A transfer test is digital camera 1 itself, and is done. It turns out that only the transfer method of 1 can be applied by a transfer test, and the transfer method is made to correspond to the kind of the memory card about the memory card in which a transfer method is restricted to 1. About the memory card which can apply two or more transfer methods. The result of a transfer test is evaluated from various viewpoints, the time, i.e., the transfer rate etc., etc. which the power consumption at the time of input and output, the power consumption at the time of input-and-output standby, and input and output take, what has the best efficiency is elected from applicable transfer methods, and it is made to correspond to the kind of the memory card.

[0054]The kind and transfer method of a memory card are memorized to the non-volatile RAM 211c of the whole control part 211. The example of the memory content of RAM211c is shown in drawing 7. This example is a thing when having memorized the information on two kinds of memory cards which contained the flash memory, and has memorized the manufacture name of a memory card, a part number, storage capacity, and a corresponding transfer method about each. The kind of memory card becomes settled uniquely by the manufacture name and a part number.

[0055]While equipping the digital camera 1 with the transfer method which the memory card of all the kinds which can be used (wearing) has, It becomes possible to actually use the memory card of an usable complete range currently developed by the time of manufacture by performing doing a transfer test, electing a transfer method and making RAM211c memorize a kind and a transfer method about the memory card of an usable complete range at the time of manufacture. And even when it equips with the memory card which can apply two or more transfer methods, it becomes possible to be able to adopt the transfer method which is most suitable for the digital camera 1 in it, and to fully employ the feature of a memory card efficiently.

[0056]Even if it faces the digital camera 1 the actual use by a user, do a transfer test using two or more transfer methods which it has, and the result of a transfer test is evaluated, The transfer method of 1 is elected from transfer methods applicable to the memory card with which it equipped, and it is memorized to RAM211c

with the kind of memory card. This processing is performed only when the kind of memory card with which it equipped is in agreement with neither of the kind memorized with the transfer method. A transfer test can be omitted when it equips with the known memory card which it became possible to use the memory card even when this equipped with the strange memory card which has not memorized the kind and the transfer method, and has memorized the kind and the transfer method.

[0057]Whenever the whole control part 211 equips with a memory card, it judges whether the kind of the memory card is identified and it is in agreement with the kind which it has memorized to RAM211c. And if in agreement, the transfer method memorized to RAM211c will be adopted as the recording medium. It is adopted as the memory card equipped with the memorized transfer method while performing processing from execution of a transfer test to the kind of memory card, and memory of a transfer method, if not in agreement. The processing which performs discernment of the kind of memory card with which it equipped, comparison of the identified kind and the kind memorized to RAM211c, execution of a transfer test, and evaluation of a test result is memorized by ROM211a as a part of program of the whole control part 211.

[0058]When a transfer test is done on the occasion of actual use and the transfer method of 1 is elected, the example of the information memorized to RAM211c is shown in drawing 8. This example is in the state of having the information on drawing 7, it is a thing when the digital camera 1 is equipped with the memory card of kind strangeness, and the information shown in drawing 8 is added to the information shown in drawing 7.

[0059]The flow of processing for transfer method setting out to the memory card 8 is shown in the flow chart of drawing 9. This processing is one subroutine of the program for which the processing which the whole control part 211 performs was described, and when it detects having equipped with the memory card 8, it is started. Whether it is equipped with the memory card judges by the signal from a point of contact formed in the card slots 17a and 17b.

[0060]First, from the memory card with which it equipped, a manufacture name, a part number, and storage capacity are read, and they are temporarily memorized to RAM211b (step #5). Subsequently, it is judged whether the match of the memory card with which it equipped, and a kind is in RAM211c by comparing the manufacture name and part number which have been memorized to the manufacture name and part number which were memorized to RAM211b, and RAM211c (#10).

[0061]A transfer test is performed when not having memorized the kind which is in agreement with the memory card with which it equipped to RAM211c. That is, the processing which reads the data which wrote in predetermined data and was written in to the memory card with which it equipped by one of the transfer methods which the digital camera 1 has is tried (#15). In the meantime, the time and electric power which writing and read-out take are measured. And the no in which the trial succeeded, and when it succeeds, the time and electric power which writing and read-out took are memorized to RAM211b (#20). Subsequently, when it judges whether all the transfer methods were tried (#25) and there is an untried transfer method, processing of step #15 and #20 is repeated until it finishes trial of all the transfer methods.

[0062]Those results are evaluated when trial of all the transfer methods is finished (#30). That is, the transfer method which can read the success or failure of each trial from RAM211b, and can be applied to the memory card with which it equipped is found out, and power consumption and a transfer rate are measured among them. And the transfer method of power consumption which were, or the highest transfer method of a transfer rate is elected (#35).

[0063]Subsequently, the manufacture name, the part number, and storage capacity of the memory card with which it equipped from RAM211b are read, these and the elected transfer method are memorized to RAM211c (#40), and the transfer method further elected as a transfer method for the memory card with which it equipped is set up (#45). And it returns to a main routine.

[0064]When having memorized the kind which is in agreement with the memory card with which it equipped by the judgment of step #10 to RAM211c, the transfer method which read the transfer method corresponding to the kind from RAM211c, and was read as a transfer method for the memory card with which it equipped is set up (#50). And it returns to a main routine.

[0065]By step #30 and #35, if the transfer method of power consumption which were is elected, it will become possible to hold down the power consumption which record and reproduction of a picture take, and the period which can be photoed will become long. If the highest transfer method of a transfer rate is elected, it will become possible to perform record and reproduction of a picture promptly, and processing speed will improve.

[0066]It may be made to evaluate the both sides of power consumption and a transfer rate. For example, the multiplication of the electric power and time which writing and read-out of data took is carried out, and the

product elects the minimum transfer method. Or the electric power and time which were required are standardized, respectively and those products elect the minimum thing. If it does in this way, it is avoidable to become possible to reconcile lessening power consumption which record and reproduction of a picture take, and performing record and reproduction of a picture promptly, for example, to elect the transfer method that there is much power consumption, while a transfer rate is very high.

[0067]Although he is trying to memorize the transfer method elected based on the result of a transfer test on the occasion of the actual use by a user in the digital camera 1 of this embodiment, it is also possible to use the elected transfer method for setting out of a limitation then, without memorizing the elected transfer method. In that case, it can replace with RAM211c and ROM can be used. The kind of memory card and the corresponding transfer method are written in the ROM at the time of manufacture. However, if it is made such, the transfer test which consumes electric power to some extent will be done whenever it equips with the memory card of kind strangeness. Therefore, the composition of always memorizing the elected transfer method like this embodiment is more preferred.

[0068]Although the example which uses a memory card as a removable recording medium here was hung up, this invention is employable also as the digital camera which uses a stick shape recording medium regardless of the gestalt of a recording medium.

[0069]

[Effect of the Invention]Make the transfer method of 1 beforehand elected based on the transfer test from one or more transfer methods applicable to the kind and recording medium of a recording medium correspond, and it memorizes, In the digital camera of this invention using the transfer method corresponding to the kind of recording medium with which it equipped, even when there are two or more transfer methods applicable to a recording medium, the feature of the recording medium can be efficiently employed certainly using the optimal transfer method. And it is possible to actually use the recording medium of these complete ranges by making the transfer method which elected by doing a transfer test about the complete range of the existing recording medium which a digital camera can use memorize.

[0070]By what a transfer test is performed, the transfer method of 1 is elected, and the transfer method is adopted for when not contained in the kind of recording medium which the kind of recording medium with which it equipped has memorized. It also becomes possible to use the recording medium of kind strangeness, and it serves as a digital camera which can also use the recording medium developed in the future.

[0071]When not having memorized the kind of recording medium with which it equipped, while performing a transfer test, electing the transfer method of 1 from one or more transfer methods applicable to the recording medium, making the kind of the recording medium, and the elected transfer method correspond and memorizing, When having memorized the kind of recording medium with which it equipped using the transfer method, in the digital camera of this invention using the transfer method corresponding to the kind of the recording medium. It is possible to actually use the recording medium of a complete range usable irrespective of whether it is the recording medium already developed or it is a recording medium developed in the future, and also those features can be employed efficiently certainly. And since there is little number of times of a required transfer test, the power consumption for it also becomes small.

[0072]If the transfer method which had least power consumption, the transfer method which was the highest, or the transfer method which had little power consumption and was high is elected in a transfer test, it will become little power consumption, high transfer efficiency, or the digital camera excellent in the field of both them.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The front view of the digital camera of one embodiment of this invention.

[Drawing 2] The rear elevation of the above-mentioned digital camera.

[Drawing 3] The side view of the above-mentioned digital camera.

[Drawing 4] The bottom view of the above-mentioned digital camera.

[Drawing 5] The block diagram showing the circuitry of the above-mentioned digital camera.

[Drawing 6] The figure showing typically the structure of the data recorded on the memory card of the above-mentioned digital camera.

[Drawing 7] The figure showing the example of the information which shows the kind of memory card memorized to RAM of the above-mentioned digital camera, and a transfer method.

[Drawing 8] The figure showing the example of the information which shows the kind of memory card which is added to RAM of the above-mentioned digital camera, and is memorized, and a transfer method.

[Drawing 9] The flow chart which shows the flow of the processing about setting out of the transfer method for the memory card in the above-mentioned digital camera.

[Description of Notations]

1 Digital camera

2 Body part

3 Image pick-up part

8 Memory card

9 Shutter release

10 LCD

17a and 17b Card slot

31 Optical finder

205 A/D converter

206 Black level correction circuit

207 WB circuit

208 Gamma correction circuit

209 Image memory

210 VRAM

211 Whole control part

211a ROM

211b RAM

211c RAM

212 Card interface

213 Voltage detector

218 Feeder circuit

250 Final controlling element

301 Taking lens

303 CCD

313 Digital disposal circuit

314 Timing generator

[Translation done.]

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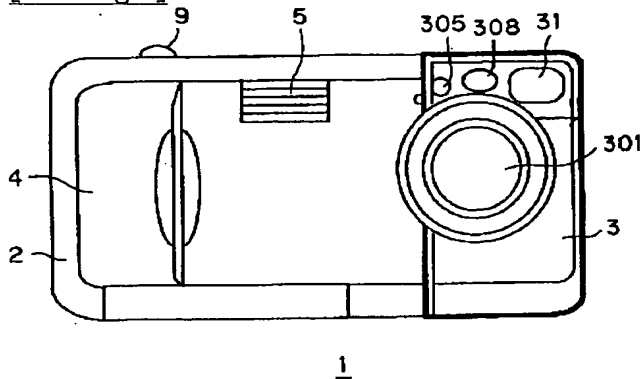
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

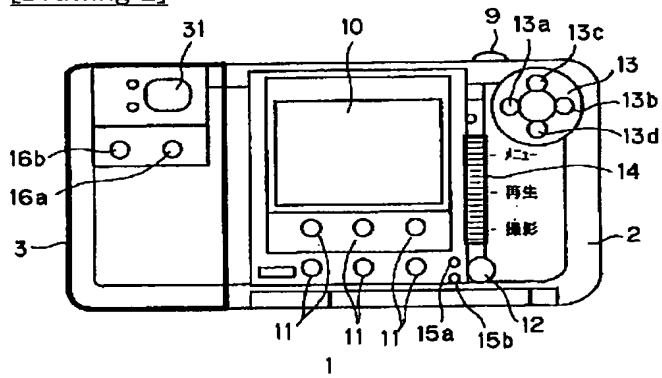
3.In the drawings, any words are not translated.

DRAWINGS

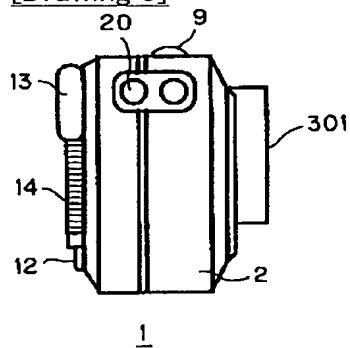
[Drawing 1]



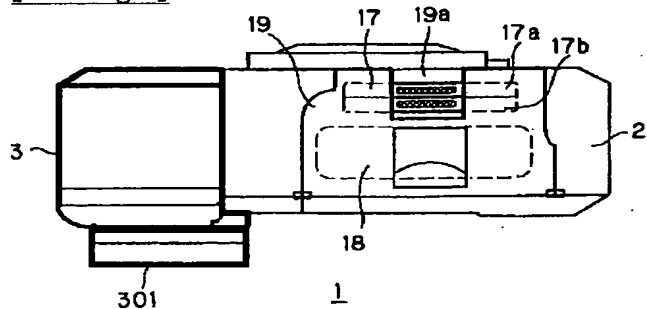
[Drawing 2]



[Drawing 3]



[Drawing 4]



メーカー名	型番	記録容量	転送方法
E	0444	128MB	trueIDEモード

Figure 1 is a block diagram of a digital still camera system, showing the interconnection of various components. The system is divided into three main functional blocks: 1 (Camera Body), 2 (Processing Unit), and 20 (Storage/Output Unit).

Block 1 (Camera Body): This block contains the front-end components for image capture. It includes a Lens (301), a CCD sensor (303), and a Signal Processor (313). A Timing Generator (314) provides synchronization signals to the CCD and the Lens Motor (309). The Lens Motor (309) is connected to the AF Lens Drive (307) and the Zoom Motor (306). The AF Lens Drive (307) is connected to the AP Sensor (308). The Zoom Motor (306) is connected to the Shutter Drive (304). The AP Sensor (308) is connected to the Shutter Drive (304). The Shutter Drive (304) is connected to the Shutter Release (202) in Block 2.

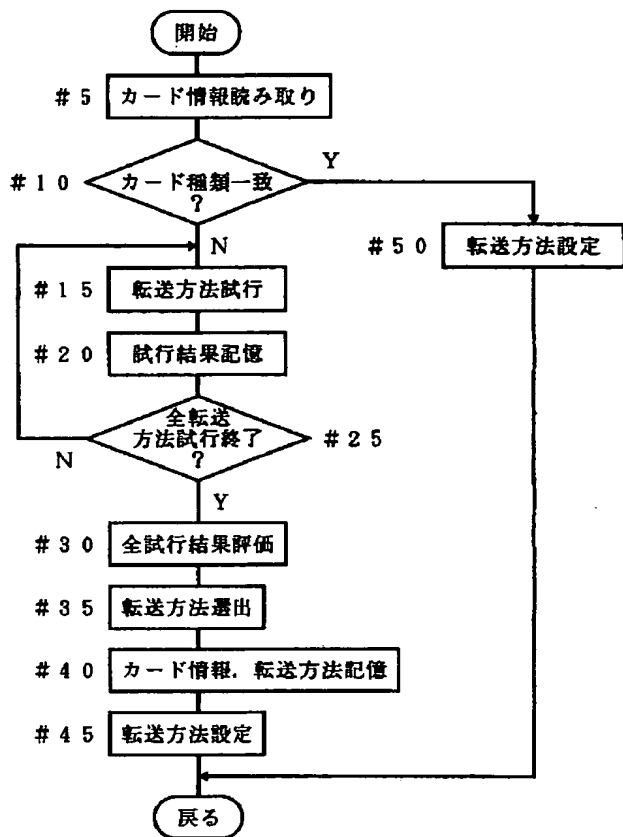
Block 2 (Processing Unit): This block handles the digital processing of the captured image. It includes an A/D Converter (205), an Image Level Correction (206), a WB (White Balance) Drive (207), a Gamma Correction (208), an Image Memory (209), and a VRAM (Video Random Access Memory) (210). The Image Memory (209) is connected to the LCD (10) and the Backlight (10a). The VRAM (210) is connected to the Operation Unit (250). The Operation Unit (250) is connected to the Card I/F (219) and the RTC (Real Time Clock) (212). The Card I/F (219) is connected to the CF Card Slot (17a, 17b). The RTC (212) is connected to the CF Card Slot (17a, 17b). The CF Card Slot (17a, 17b) is connected to the Memory Card (8). The Main Control Unit (211) is the central processing unit, containing RAM (211b, 211c) and ROM (211a). It is connected to the A/D Converter (205), the Image Level Correction (206), the WB Drive (207), the Gamma Correction (208), the Image Memory (209), the VRAM (210), the LCD (10), the Backlight (10a), the Operation Unit (250), the Card I/F (219), the RTC (212), the CF Card Slot (17a, 17b), the Memory Card (8), the Battery (5), the Rechargeable Battery (213), and the Shutter Release (202).

Block 20 (Storage/Output Unit): This block contains the storage and output components. It includes the LCD (10), the Backlight (10a), the Operation Unit (250), the Card I/F (219), the RTC (212), the CF Card Slot (17a, 17b), and the Memory Card (8). The LCD (10) is connected to the Backlight (10a). The Backlight (10a) is connected to the Operation Unit (250). The Operation Unit (250) is connected to the Card I/F (219). The Card I/F (219) is connected to the RTC (212). The RTC (212) is connected to the CF Card Slot (17a, 17b). The CF Card Slot (17a, 17b) is connected to the Memory Card (8).

The diagram illustrates the flow of data and control signals between these components, showing how the camera captures an image, processes it, and stores it on a memory card or outputs it to a display.

The diagram illustrates the structure of a video tape. On the left, a vertical stack of frames is shown, labeled from top to bottom: 1コマ目 (Frame 1), 1コマ目に対する音声ファイル (Audio file for Frame 1), 2コマ目 (Frame 2), 3コマ目 (Frame 3), nコマ目 (Frame n), and 40コマ目 (Frame 40). On the right, a vertical stack of data blocks is shown, labeled from top to bottom: タグ (Tag), 高解像度画像データ (High-resolution image data), and サムネイル画像データ (Thumbnail image data). Dashed lines indicate the mapping: the audio file for Frame 1 is linked to the Tag block, and the frame data for Frame n is linked to the High-resolution image data block.

メーカー名	型番	記録容量	転送方法
A	1234	32MB	I/Oモード
B	5678	16MB	trueIDEモード



[Translation done.]

モードとtrueIDEモードの双方を有するフラッシュメモリーが装着されたときは、trueIDEモードに設定される。

【0008】
 [発明が解決しようとする課題] ところが、2以上の転送方法が有する配線媒体に対して決定されている転送方法が常に最高の転送速度を実現されているとは限らず、デジタルカメラの構成によっては別の転送方法が最高の転送速度を実現するものとなることがある。また、転送速度と電力消費は直接には関係ないから、最高の転送速度となる転送方法を採用すると電力消費が大きくなることとなる。そのような場合、別の転送方法を採用すれば、転送速度をあまり低下させることなく電力消費を大幅に削減し得る可能性もある。

【0009】したがって、2以上の転送方法を有する記録媒体に対する転送方法を、その記録媒体とデジタルカメラとの相性を考慮することなく決定するのは、適切な方法とはいえない。記録媒体の特長を生かすには、より柔軟な方法で転送方法を定めるのが好ましい。

【0010】また、従来のデジタルカメラは、転送方法が1の記録媒体であっても、そのメーカーや型番をあらかじめ記憶していないときには、どの転送方法に設定するかを判断することができず、装置可能な既存の型番媒体を全て使用することはできない。将来開発される型番未知の記録媒体に対する転送方法を設定することも当然である。新たな開発される優れた記録媒体の特長を利用することは、その後製造されるデジタルカメラにおいてものみ可能になる。

【0011】本発明は、このような問題点に鑑みてなされたもので、複数の転送方法を有し、記録媒体を装着したときにその記録媒体の長さを十分に生かす転送方法を用い得るデジタルカメラを提供することを目的とし、さらに、将来開発される記録媒体も使用することが可能なデジタルカメラを提供することを目的とする。

【0012】
 【課題を解決するための手段】上記目的を達成するため
 に、本発明では、荷役可能な記録媒体と間のデータ転
 送のために複数の転送方法を有するデジタルカメラにお
 て、1種類以上の記録媒体について、記録媒体の種類
 とその記録媒体に適用可能な以上の転送方法の中から
 転送試験に基づいてあらかじめ選出された1の転送方法
 とを対応させて記憶しておき、記録媒体を装着するごと
 に装着した記録媒体の種類を判別して、装着した記録媒
 体の種類に対応する転送方法を装着した記録媒体との間
 のデータ転送に用いるものとする。

【0013】このデジタルカメラは、記録媒体の種類とその種類の記録媒体に適用可能な1の転送方法とを対応させて記憶しておき、装置された記録媒体ととのデータの転送に、その記録媒体の種類に対応する転送方法を採用する。記録媒体の種類に対応させる転送方法は、記録

の転送試験に基づいて選ばれたものである。記録媒体に通用可能な転送方法が2以上あるときは、電力消費、転送速度等、転送に関する何らかの特性に着目して転送試験の結果を評価し、デジタルカメラに最適な転送方法を選ぶことができる。したがって、記録媒体の特長を十分に生かすことが可能になる。

【0014】転送試験や転送方法の選出は、例えば、デジタルカメラのメーカーが行う。デジタルカメラが使用し得る既存の記録媒体の全種類について、転送試験を行って選出した転送方法を記憶させておけば、それら全種類の記録媒体を実際に使用することが可能で、しかも個々の記録媒体の特長を生かし得るデジタルカメラとなる。

【0015】このデジタルカメラは、装着した記録媒体の暗写が記憶している記録媒体の種類に含まれないときと、装着した記録媒体との間で暗写の転送方法を用いる1転送試験を実行して、装着した記録媒体に適用可能な1以上の転送方法の中から1の転送方法を選択し、選択した転送方法を装着した記録媒体との間のデータ転送に用いるものとすることができる。

【0016】このようにすると、デジタルカメラに上
て輝度が未知の記録媒体が装着されるときでも、その配
記録媒体を使用された記録媒体とも使用することができ
製造後に開発された記録媒体とも使用することができ
る。しかも、転送方法の選出を実際の転送試験に基づい
て行うから、種類および転送方法に記述している記録媒
体と全く同様に、種類未知の記録媒体の特徴が生かれ
る。

【００１７】上記目的を達成するために、本発明では、た、複製可能な記録媒体との間でデータ転送のために複製した、複製可能な記録媒体において、記録媒体の転送方法を有するデジタルカメラにおいて、記録媒体を装着することによって装着した記録媒体の種類を判別し、装着した記録媒体の種類を記憶していないときに、装着した記録媒体との間で複製の転送方法を用いる転送を試験を実行して、装着した記録媒体に適用可能な以上の転送方法の中から１の転送方法を選出し、装着した記録媒体の種類と選出した転送方法とを対応させて記憶するとともに、選出した転送方法を装着した記録媒体との間のデータ転送に用い、装着した記録媒体の種類に対応する転送方法を選択した記録媒体とのかのデータ転送に用いるものとする。

【0018】このデジタルカメラは、前述のデジタルカメラと同様に、記録媒体の種類とその種類の記録媒体に適用可能な1の転送方法とを対応させて記憶しておき、装着された記録媒体ととの間のデータ転送に、その記録媒体の種類に対応する転送方法を採用するが、さらに、種類未知の記録媒体が装着されることに、転送方法を実際に行なった1の転送方法を選出し、その記録媒体の種類と一致した転送方法を記憶する。つまり、転送方法を記憶し、選出して転送方法を記憶する。

している記録媒体の種類をデジタルカメラ自体で増して
いく。

【0019】このため、既存のおよび将来開発される使用可能な全種類の記録媒体の特性を生かすことができるとだけでなく、その価値のために転送試験像の回数を抑える必要最小限に抑えて、転送試験に要する電力消費を低減することが可能になる。使用し得る既存の記録媒体の全種類をデジタルカメラに装着するという処理をデジタルカメラのメーカーが行うのであれば、その後に開発された記録媒体を装着するときのみには転送試験を行うことになり、使用者による実例の使用においては転送試験の電力消費はごく僅かになる。

【0020】デジタルカメラ自身が転送試験を行う構成では、転送試験において電力消費が最も少なかった転送方法、または電力消費量が最も高く転送速度が最も高く転送速度が最も少なかった転送方法を選択する。さらに、電力消費量が最も高く転送速度が最も少なかった転送方法を選択すると、少ない電力消費、高い転送効率、あるいはそれら両方の面で優れたデジタルカメラとなる。

【0021】
【発明の実施の形態】以下、本発明のデジタルカメラの
一実施形態について図面を参照しながら説明する。図1
～図4に本実施形態のデジタルカメラ1の外観を示し、
図5にその回路構成を示す。図1はデジタルカメラ1の
正面図、図2は背面図、図3は側面図、図4は底面図で
ある。

【0022】デジタルカメラは、略直方形状の本体部2と撮像部3（図1～4において太線で示す）より成る。撮像部3は本体部2の側面に取り付けられており、その前面に撮影レンズ301を有する。撮影レンズ301はマクロ機能付きのズームレンズであり、□怪固定の絞りを備えている。撮像部3の内部の撮影レンズ301の後方には、撮像素子である電荷転移素子（CCD）302が配置されている（図5参照）。CCD302は、赤色（R）光、緑色（G）光および青色（B）光に対して選択的に感応する3種の画素を2次元に交互に配列して成り、カラーエリアセンサとして構成されている。

【0023】撮像部3の内部には、CCD303が出力するアナログ信号を処理する信号処理回路313、CCD303の光電変換の開始を指示する出力等の動作のタイミングを指示する信号を生成し、出力部3に与えるタイミングジェネレータ314、撮影レンズ301の焦点距離を変えるズームモータ306、および撮像レンズ301の焦点を変えるフォーカスモータ307が備えられている。撮像部3には、また、フラッシュ撮影において自動露光制御をするための露光回路304および露光センサ305、撮影対象までの距離を検出するAFセンサ308、ならびに光学ファインダ31も備えられている。

【0024】デジタルカメラ1は非撮影時に撮影レンズ

3.30.1の大部分を画像位置3に収容し得るように構成されており、撮影レンズ3.01は、撮影時に設定される撮影位置と非撮影時に設定される収容位置とをとる。ズームモータ3.06は、撮影レンズ3.01の撮影位置と収容位置との移動にも用いられる。また、画像位置3には、撮影レンズ3.01が撮影位置と収容位置のいずれにあるかを検出するためのレンズセンサ3.8が設けられている。

【0025】本体部2の前面にはディスプレイ部4とフラッシュメモリ部5が設けられており、本体部2の上にはシャッターボタン9が設けられている。シャッターボタン9は、半押しされたときと信号S1を発生し、全押しされたときと信号S2を発生する。デジタルカメラ1は、撮像素子3の01の焦点を撮像対象に対して自動的に合わせる自動焦点調整部(AF)機能と、撮像対象の明るさに応じてCCD部3の露光を自動的に制御する自動露光制御部(AE)機能を備えており、信号S1はAF制御とAE制御の開始を指示する。信号S2は、記録用の画像の撮像と記録した記録用画像を抜き出す操作の記録を指示する。

【0026】図2に示すように、本体部2の背面には、透過型の液晶表示装置（LCD）10、押しボタン式の6つのスイッチ11、電源スイッチ12および4接点スイッチ13、スライド式のスイッチ14、ならびに2つの発光ダイオード15a、15bが設けられている。LCD10は、撮影した画像を使用者へのメッセージを表示する。スイッチ11はデジタルカメラ11の動作に関する種々の設定に用いられ、電源スイッチ12は電源から各部への電力供給の開始と停止の指示に用いられる。

【0027】4接点スイッチ13は単一の操作部材と4つの接点より成り、4つのスイッチ13a~13dを構成する。スイッチ13a、13bは図9のレンズ301の焦点距離の設定すなわちズームングの指示に用いられ、スイッチ13c、13dはAに制御におけるCCD303の露光補正の指示に用いられる。

【0028】デジタルカメラ1は、撮影モード、再生モードおよびメニューモードを用いており、スイッチ14は、これらのモードの設定に用いられる。撮影モードは、CCD303によって画像が撮影して、撮影した画像を表す画像データを生成するモードである。撮影および画像データの生成は既一定の期間（例えば1/30秒）で繰り返り進められ、シャッターボタン9の操作により信号S2が发せられると、それに応じて記録用の画像が撮影され、その画像を表す画像データが記録媒体に記録される。撮影モードにおいては、次に撮影される画像をLCD10に直ちに表示して、ライブビューを提供することもできる。このとき、LCD10は電子ビューファインダとして機能する。

【0029】再生モードは記録媒体に記録している画像データを読み出して、その画像をLCD1.0に表示するモードである。また、メニューモードは、LCD1.0に

案内メッセージを表示し、スイッチ11の操作に応じて動作を行うモードである。

【0030】発光ダイオード15aは、発光部から各部への電力供給が行われる間点灯し、発光ダイオード15bは記録媒体の入出力が行われている間点灯する。発光ダイオード15aは電源電圧の低下を利用者に知らせるためにも用いられる。

【0031】撮像部3の背面には、2つの押しボタン式スイッチ16a、16bが設けられている。スイッチ16aは、撮影モードにおいてLCD10にライブビューを表示するか否かの指示に用いられ、スイッチ16aが操作されるごとにライブビュー表示のオン/オフが切り替わる。専ら光学ファインダ31を用いて撮影をする場合、LCD10の表示をオフにすることにより、電力消費を抑えることができる。再生モードおよびメニューモードにおける再生画像や案内メッセージの表示は、スイッチ16aの操作にかかわらず行われる。スイッチ16bはマクロ撮影をするか否かの指示に用いられる。

【0032】デジタルカメラ1では、電源として、直列接続した4本の単三型電池Eを使用する。また、画像データを記録する記録媒体として、省電力可能なメモ리카ード8を使用する。メモ리카ード8は2枚装荷可能である。メモ리카ード8およびそれらの動作制御においては、後に詳述する。図4に示すように、本体部2には、電池Eを収納する電池室18と、2つのカードスロット17a、17bを有しメモ리카ード8を収容するカード室17が設けられており、本体部2の底面には電池室18とカード室17を開閉するクラムシェルタイプの蓋19が備えられている。

【0033】カードスロット17aには、メモ리카ードに代えて、USBカードや音声カードを装着することも可能である。蓋19にはUSBカードの端子部分を露出させるための開口19aが設けられており、USBカードの端子にケーブル接続することにより、デジタルカメラ1を外部機器に直接接続することができる。

【0034】図3に示すように、本体部2の側面にはD端子端子20が設けられており、デジタルカメラ1は、内蔵の電池Eのほか、端子20を介して外部から与えられる電力によっても動作する。

【0035】デジタルカメラ1の回路構成について、図5を参照して説明する。撮像部3に設けられた信号処理回路313は、相関二重サンプリング(CDS)回路および自動ゲイン制御(AGC)回路より成る。CDS回路はCCD303が出力するアナログ信号のノイズを低減させ、AGC回路は、そのゲインによってCDS回路からの全ての信号のレベルを調整する。なお、CDS回路のゲインは以下に述べる全体制御部によって変えられる。

【0036】本体部2は、デジタルカメラ1の全体を制御する全体制御部211を備えている。全体制御部21

1は、その制御プログラムや制御パラメータを記したROM211a、一時的な記憶に使用するRAM211b、および記録媒体であるメモ리카ード8に関する情報を記憶するための不揮発性のRAM211cを備えており、また、使用者によって操作される操作部250に接続されている。操作部250は、前述のスイッチボタン9、スイッチ14等の諸操作部材を含み、使用者による操作を全体制御部211に伝達する。

【0037】本体部2は、信号処理回路313より与えられるCCD303の出力信号を処理して画像データを生成するために、A/Dコンバータ205、黒レベル補正回路206、ホワイトバランス(WB)回路207、 γ 補正回路208、および画像メモリ209を備えている。A/Dコンバータ205は、信号処理回路313からのアナログ信号を10ビットのデジタル信号に変換し、黒レベル補正回路206は、デジタル化された信号の黒レベルを基準のレベルに合わせる。

【0038】WB回路207は、次に行う γ 補正の後に通正なホワイトバランスが得られるように、全体制御部211から供給されるレベル変換テーブルを用いて、

R、G、Bの各色成分の信号のレベルを個別に変換する。なお、全体制御部211は、レベル変換テーブルの各色成分の変換係数(特性の傾き)を、撮影した画像ごとに設定する。 γ 補正回路208は、表示に適するよう

に、WB回路207からの信号に非線形化処理を施す。【0039】信号処理回路313から γ 補正回路208までの処理により、CCD303によって撮影された画像を表す画像データが生成される。画像メモリ209は、こうして生成された画像データを1フレーム分記憶する。画像メモリ209はCCD303の画素数に相当

する記憶容量を有しており、各画素の出力から生成した信号をその画素に対応する位置に記憶する。なお、黒レベル補正回路206から γ 補正回路208までの各回路の処理結果は、実際には全体制御部211のRAM211bを介して次の回路に提供されるが、図5においては、処理の流れを明らかにするために、黒レベル補正回路206から画像メモリ209までを破線の矢印で接続して表している。

【0040】本体部2には、LCD10に画像を表示する際にバックアップメモリとして使用するVRAM210、LCD10のバックライト光源10a、およびメモ리카ード8への画像データの書き込みやメモ리카ード8からの画像データの読み出しを行うカードインターフェース(1/F)212も備えられている。VRAM210はLCD10の画素数に相当する記憶容量を有しており、全体制御部211は、ライブビューや再生画像を表示するときは、画像メモリ209やメモ리카ード8から読み出した画像データの中から所定の画素範囲で信号を抽出し、それらの信号をVRAM210に書き込む。

【0041】本体部2には、このほか、タイミング制御

JPEG方式に従って画像データの圧縮を行う。また、全体制御部211は、画像データから所定の画素範囲で信号を抽出して別の画像データを生じ、これもメモ리카ード8に記録させる。この画像データは、撮影した高解像度の画像の数分の1の大きさのサムネイル画像を表す。タグ情報には、フレーム番号や撮影日時のほか、露光等の撮影条件に関する情報が含まれる。

【0047】メモ리카ード8に記録するデータの構造を図6に模式的に示す。1フレームの画像情報は、タグ情報、圧縮された1600×1200画素の高解像度画像データ、および80×60画素のサムネイル画像データより成り、約1MBのデータ量を有する。メモ리카ード8に記録し得る画像のフレーム数は、当然、そのメモ리카ード8の記録容量に依存する。なお、音声カードを装着しているときは、フレームごとには音声ファイルも記録することが可能であり、タグに音声ファイルへのリンクに関する情報が記される。

【0048】前述のように、デジタルカメラ1は2つのカードスロット17a、17bを備えており、2枚のメモ

リカード8を同時に装着することができる。カードスロット17a、17bに装着し得るメモ리카ード8の種類は1つに限られず、例えば、回路構成の異なるフラッシュメモリを内蔵した半導体メモ리카ードやハードディスクカードを、カードスロット17a、17bの各々に装着することが可能である。また、カードスロット17a、17bの種類異なるメモ리카ードを同時に装着することもできる。

【0049】撮影レンズ301に固定鏡りを備えたデジタルカメラ1では、A/E制御をCCD303の光電変換部(電子シャッター速度)の調節により行う。A/E制御は、周知のAPEXシステムに基づいて、全体制御部211が行う。A/E制御に必要な撮影対象の明るさは、生成した画像データより求める。すなわち、画像データのうち、CCD303の所定範囲(例えば中央部)に対応する画素の信号強度の総和を撮影対象の明るさとする。

【0050】A/E制御は、前述のように、信号S1に応じてA/F制御と共に開始するが、信号S2が検出されるまでは撮影対象の明るさの検出のみを行っており、信号S2により記録用画像の撮影が指示された時に初めて、電子シャッター速度の調節を行う。その間、電子シャッター速度は一定にしておく。これにより、画像データの生成処理を一定周期で行うことが可能になり、全体制御部211の制御処理が複雑になるのを避けることができる。

【0051】撮影対象が暗く、検出した明るさから算出した電子シャッター速度が手ふれを起す可能性のある速度になるときは、電子シャッター速度を手ふれ限界速度に設定するとともに、信号処理回路313に含まれるAGC回路のゲインを上昇させて、CCD303が露光

する全体制御部211を備えている。全体制御部21

不足になるのを補償する。これにより、撮影対象がある程度暗い場合でも、撮影対象を良好な明るさで表示画像を提供することができ、なお、ゲインを最大にしても露光不足を補うことができないほど撮影対象が暗いときには、手ぶれ限界速度で撮影してゲインを最大に設定するとともに、露光不足になる可能性があることを警告して、フラッシュ撮影を行う等の適切な対策を講じることが使用者に促す。

【0052】デジタルカメラ1では、カードスロット17a、17bの各々に種類の異なるメモリカード8を装着し得るようにしていることに対応して、メモリカード8との間のデータ転送のために複数の転送方法を備えるとともに、装着しているメモリカード8の種類に応じて転送方法を切り替えるようにしている。しかも、メモリカードの種類と転送方法との対応関係を、実際に行った転送試験に基づいて設定する。

【0053】転送試験はデジタルカメラ1そのもので行う。転送方法が1に限られるメモリカードについては、転送試験により1の転送方法のみが適用可能であることが判り、その転送方法をそのメモリカードの種類に対応させる。2以上の転送方法を適用し得るメモリカードについては、転送試験の結果を、入出力時の電力消費、入出力待機時の電力消費、入出力に要する時間すなわち転送速度等、種々の観点から評価して、適用可能な転送方法の中から最も効率のよいものを選出して、それをそのメモリカードの種類に対応させる。

【0054】メモリカードの種類と転送方法は、全体制御部211の不揮発性RAM211cに記憶する。RAM211cの記憶内容の例を図7に示す。この例はフラッシュメモリを内蔵した2種類のメモリカードの情報を記憶しているときのものであり、各々について、メモリカードのメーカー名、型番、記録容量、および対応する転送方法を記憶している。メモリカードの種類はメーカー名と型番によって一意に定まる。

【0055】使用（装着）可能な全ての種類のメモリカードが有する転送方法をデジタルカメラ1に備えるとともに、使用可能な全種類のメモリカードについて、転送試験を行って転送方法を選出し、種類と転送方法をRAM211cに記憶させることを製造時に行っておくことで、製造時までに開発されている使用可能な全種類のメモリカードを実際に使用することが可能になる。しかも、2以上の転送方法を適用することができ、メモリカードを装着したときでも、その中で最もデジタルカメラ1に適する転送方法を採用することができ、メモリカードの特長を十分に生かすことが可能になる。

【0056】デジタルカメラ1は、使用者による実際の使用に際しても、備えている複数の転送方法を用いて転送試験を行い、転送試験の結果を評価して、装着したメモリカードに適用可能な転送方法の中から1の転送方法を選出し、それをメモリカードの種類と共にRAM211

1cに記憶する。この処理は、装着したメモリカードの種類が転送方法と共に記憶している種類のいずれにも一致しないときのみに行う。これにより、種類と転送方法を記憶していない未知のメモリカードを装着したときでもそのメモリカードを使用することが可能になり、また、種類と転送方法を記憶している既知のメモリカードを装着したときには、転送試験を省略することができ

る。

【0057】全体制御部211は、メモリカードを装着すること、そのメモリカードの種類を識別して、それがRAM211cに記憶している種類と一致しているかを否かを判定する。そして、一致していれば、RAM211cに記憶している転送方法をその記録媒体に採用する。一致していなければ、転送試験の実行からメモリカードの種類および転送方法の記憶までの処理を行うとともに、記憶した転送方法を装着したメモリカードに採用する。なお、装着したメモリカードの種類を識別した種類とRAM211cに記憶している種類の比較、転送試験の実行、および試験結果の評価を行う処理は、全体制御部211のプログラムの一部としてROM211aに記憶されている。

【0058】実際の使用に際して転送試験を行って、1の転送方法を選出したときにRAM211cに記憶する情報の例を図8に示す。この例は、図7の情報に有する状態で、種類未知のメモリカードがデジタルカメラ1に装着された場合のものであり、図8に示した情報は図7に示した情報に追加される。

【0059】メモリカード8に対する転送方法設定のための処理の流れを図9のフローチャートに示す。この処理は、全体制御部211が行う処理を記したプログラムの1つのサブルーチンであり、メモリカード8を装着したことを検出したときに開始される。メモリカードが装着されているか否かは、カードスロット17a、17bに設けられている接点からの信号で判定する。

【0060】まず、装着したメモリカードから、メーカー名、型番および記録容量を読み取り、それらを一時的にRAM211bに記憶する（ステップ#5）。次に、RAM211bに記憶したメーカー名および型番とRAM211cに記憶しているメーカー名および型番とを比較することにより、装着したメモリカードと種類の一致するものがRAM211cにあるかを判定する（#10）。

【0061】装着したメモリカードと一致する種類をRAM211cに記憶していないときは、転送試験を実行する。すなわち、デジタルカメラ1が有する転送方法の1つで、装着したメモリカードに所定のデータを書き込み、書き込んだデータを読み出す処理を試みる（#15）。その間、書き込みおよび読み出しに要する時間と電力とを測定しておく。そして、その試みが成功した否

しに要した時間と電力とをRAM211bに記憶する（#20）。次いで、全ての転送方法を試行したか否かを判定し（#25）、未試行の転送方法があるときは、全ての転送方法の試行を終えるまで、ステップ#15、#20の処理を繰り返す。

【0062】全ての転送方法の試行を終えたときは、それらの結果を評価する（#30）。すなわち、RAM211bから個々の試行の成否を読み出して、装着したメモリカードに適用可能な転送方法を見出し、それらの間で電力消費や転送速度を比較する。そして、電力消費の最も少なくかつ転送速度が最も高い転送方法を選出す（#35）。

【0063】次に、RAM211bから装着したメモリカードのメーカー名、型番および記録容量を読み出して、これらと選出した転送方法をRAM211cに記憶し（#40）、さらに、装着したメモリカードに対する転送方法として選出した転送方法を設定する（#45）。そして、メインルーチンに戻る。

【0064】ステップ#10の判定で、装着したメモリカードと一致する種類をRAM211cに記憶しているときは、その種類に対応する転送方法をRAM211cから読み出し、装着したメモリカードに対する転送方法として読み出した転送方法を設定する（#50）。そして、メインルーチンに戻る。

【0065】ステップ#30、#35で、電力消費の最も少なくかつ転送速度を選出すことが可能になり、撮影可能な期間が長くなる。また、転送速度の最も高かった転送方法を選出される。画像の記録や再生を速やかに行うことが可能になり、処理速度が向上する。

【0066】電力消費と転送速度の双方を評価するようにしてもよい。例えば、データの書き込みや読み出しに要した電力と時間とを算出して、その中で最小の転送方法を選出する。あるいは、要した電力と時間とをそれぞれ規格化しておいて、それらの積が最小のものを選出する。このようにすると、画像の記録や再生に要する電力消費を少なくすること、画像の記録や再生を速やかに行うことを両立させることが可能になり、例えば、転送速度がきわめて高い反面、電力消費が多いという転送方法を選出するのを避けることができる。

【0067】本実施形態のデジタルカメラ1では、使用者による実際の使用に際し、転送試験の結果に基づいて選出した転送方法を記憶するようにしているが、選出した転送方法を記憶せずに、選出し転送方法をそのときの限りの設定に用いるようにすることも可能である。その場合、RAM211cに代えてROMを使用することができ、そのROMにはメモリカードの種類と対応する転送方法を製造時に書き込んでおく。ただし、そのようにすると、ある程度電力を消費する転送試験を、種類未知のメモリカードを装着することに行うことになる。

したがって、本実施形態のように、選出した転送方法を常に記憶する構成の方が好ましい。

【0068】なお、ここでは簡略可能な記録媒体としてメモリカードを使用する例を挙げたが、本発明は、記録媒体の形態には無関係であり、例えばフラッシュ状の記録媒体を使用するデジタルカメラにも採用可能である。

【0069】

【発明の効果】記録媒体の種類とその記録媒体に適用可能な1以上の転送方法の中から転送試験に基づいてあらかじめ選出された1の転送方法とを対応させて記憶しておき、装着した記録媒体の種類に対応する転送方法を用いる本発明のデジタルカメラでは、記録媒体に適用可能な転送方法が1以上あるときでも、最適な転送方法を用いて、その記録媒体の特長を簡便に生かすことができ、しかも、デジタルカメラが使用し得る既存の記録媒体の全種類について、転送試験を行って選出した転送方法を記憶しておくことで、それら全種類の記録媒体を実際に使用することが可能である。

【0070】また、装着した記録媒体の種類が記憶している記録媒体の種類に含まれないときに、転送試験を実行して1の転送方法を選出し、その転送方法を採用することで、種類未知の記録媒体を使用することも可能になり、将来開発される記録媒体をも使用することができ、デジタルカメラとなる。

【0071】装着した記録媒体の種類を記憶していないときに、転送試験を実行してその記録媒体に適用可能な1以上の転送方法の中から1の転送方法を選出し、その記録媒体の種類と選出した転送方法とを対応させて記憶するとともに、その転送方法を用い、装着した記録媒体の種類を記憶しているときに、その記録媒体の種類に対応する転送方法を用いる本発明のデジタルカメラでは、既に開発されている記録媒体であるが将来開発される記録媒体であるかかわらず、使用可能な全種類の記録媒体を実際に使用することが可能である上、それらの特長を簡便に生かすことができる。しかも、必要な転送試験の回数が少ないから、そのための電力消費も留かになる。

【0072】転送試験において電力消費が最も少なかった転送方法、転送速度が最も高かった転送方法、または電力消費が少なくかつ転送速度が高かった転送方法を選出するようにすると、少ない電力消費、高い転送効率、あるいはそれら両方の面で優れたデジタルカメラとなる。

【図面の簡単な説明】

【図1】 本発明の一実施形態のデジタルカメラの正面図。

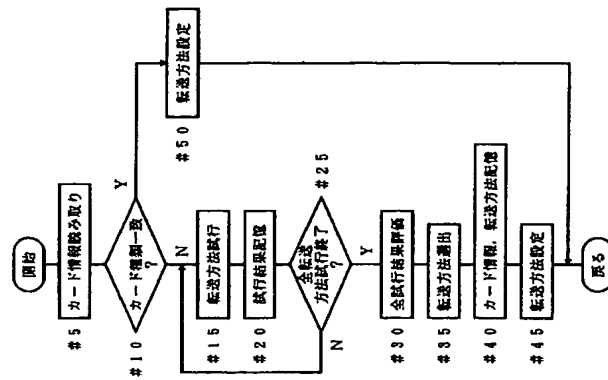
【図2】 上記デジタルカメラの背面図。

【図3】 上記デジタルカメラの側面図。

【図4】 上記デジタルカメラの底面図。

【図5】 上記デジタルカメラの回路構成を示すブロック

[図9]



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